NATIONAL GUIDELINE CLEARINGHOUSE™ (NGC)
GUIDELINE SYNTHESIS

MANAGEMENT AND TREATMENT OF PRESSURE ULCERS

Guidelines

1. Consortium for Spinal Cord Medicine (CSCM) Clinical Practice Guidelines. Pressure ulcer prevention and treatment following spinal cord injury 2000 (reviewed 2005). J Spinal Cord Med 2001 Spring;24(Suppl 1):S40-101. [448 references] PubMed
2. University of Iowa Gerontological Nursing Interventions Research Center (UIGN). Treatment of pressure ulcers. Iowa City (IA): University of Iowa Gerontological Nursing Interventions Research Center, Research Dissemination Core; 2002 Aug. 30 p. [58 references]
3. Wound, Ostomy, and Continence Nurses Society (WOCN). Guideline for prevention and management of pressure ulcers. Glenview (IL): Wound, Ostomy, and Continence Nurses Society (WOCN); 2003. 52 p. (WOCN clinical practice guideline; no. 2). [141 references]

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INTRODUCTION:

A direct comparison of the Consortium for Spinal Cord Medicine (CSCM), University of Iowa Gerontological Nursing Interventions Research Center (UIGN), and Wound, Ostomy, and Continence Nurses Society (WOCN) recommendations for the treatment of pressure ulcers is provided in the tables below.

The guidelines differ somewhat in scope. In addition to addressing treatment of pressure ulcers, CSCM and WOCN address ulcer prevention, a topic that is beyond the scope of this synthesis. (Note: see the synthesis, Prevention of Pressure Ulcers). While most of the guidelines provide recommendations for the general population of adults at risk for pressure ulcers (including adults in acute and long-term care facilities), the CSCM guideline focuses specifically on persons with spinal cord injury.

CSCM and WOCN reviewed the recommendations of the 1994 Agency for Health Care Policy and Research (AHCPR) guideline, "Treatment of Pressure Ulcers". (NGC note: because of its 1994 publication date, the AHCPR guideline does not meet criteria for inclusion in the NGC).

Table 1 compares the scope of each of the guidelines. Table 2 compares recommendations for the assessment/diagnosis and treatment of pressure ulcers, including care plans; wound care; management of infection, tissue load, pain, and nutrition; adjunctive therapy; surgical intervention; and reassessment and ongoing care. Table 3 compares the potential benefits and harms associated with the implementation of each guideline.

The level of evidence supporting the major recommendations is also identified, with the definitions of the rating schemes used by CSCM, UIGN, and WOCN included in Table 4. References supporting selected recommendations of the UIGN guidelines are also provided in this table.

Following the content comparison tables, the areas of agreement and differences among the guidelines are identified.

Abbreviations:

- AHCPR, Agency for Health Care Policy and Research (now the Agency for Healthcare Research and Quality, AHRQ)
- CSCM, Consortium for Spinal Cord Medicine
- NGC, National Guideline Clearinghouse
- UIGN, University of Iowa Gerontological Nursing Interventions Research Center
- WOCN, Wound, Ostomy, and Continence Nurses Society

TABLE 1: COMPARISON OF SCOPE AND CONTENT	
Objective And Scope	
CSCM (2000 reviewed 2005)	• To provide guidance and assistance in the decisions required to restore health, independence, control, and self-esteem to people with spinal cord injury • To provide a conceptual framework within which to develop effective strategies for preventing and treating pressure ulcers

UIGN (2002)	• To treat pressure ulcers among elderly patients • To enhance the healing of pressure ulcers
WOCN (2003)	• To present an evidence-based guideline for pressure ulcer prevention and management • To improve cost-effective patient outcomes as well as increase wound research in the areas where there are gaps between research and practice
Target Population	
CSCM (2000 reviewed 2005)	• United States • Adolescents and adults with spinal cord injury (SCI)
UIGN (2002)	• United States • Adult patients who have been identified with pressure ulcers or who are "at risk" for pressure ulcers
WOCN (2003)	• United States • Patients with or at risk for developing pressure ulcers
Intended Users	
CSCM (2000 reviewed 2005)	Advanced Practice Nurses Allied Health Personnel Health Plans Hospitals Managed Care Organizations Nurses Occupational Therapists Patients Physicians Psychologists/Non-physician Behavioral Health Clinicians Social Workers
UIGN (2002)	Advanced Practice Nurses Dietitians Health Care Providers Hospitals Nurses Physical Therapists Physician Assistants Physicians

WOCN (2003)	Advanced Practice Nurses Allied Health Personnel Health Care Providers Nurses Physical Therapists Physician Assistants Physicians
Interventions And Practices Considered	
CSCM (2000 reviewed 2005)	Assessment/Diagnosis 1. History and physical exam 2. Assessment of other factors (psychological health, availability of care assistance, etc.) 3. Pressure ulcer assessment and documentation Treatment 1. Care plan 2. Wound cleansing, debridement, and dressing 3. Management of infection (culture, biopsy, antibiotics) 4. Tissue load management, including positioning, posture evaluation, and use of pressure-reducing devices 5. Nutritional assessment and intervention 6. Referral for surgical intervention, including preoperative and postoperative care and identification of complications of surgery 7. Adjuvant therapy (electrical stimulation) Note: ultraviolet radiation, low-energy laser radiation, normothermia, ultrasound, subatmospheric pressure therapy, hyperbaric oxygen, topical agents, cytokine growth factors, and nonantibiotic systemic drugs were reviewed but not recommended. 8. Referral for psychosocial interventions 9. Monitoring of healing pressure ulcers 10. Management of complications of pressure ulcers
UIGN (2002)	Assessment/Diagnosis 1. Pressure ulcer assessment, including photos to document and monitor progress Treatment 1. Care plan

	2. Wound cleansing, debridement, and dressing 3. Management of infection (culture, topical antibiotics) 4. Tissue load management 5. Nutritional assessment and intervention 6. Adjuvant therapy (hyperbaric oxygenation, negative pressure wound therapy, and electrical stimulation) 7. Monitoring of healing pressure ulcers
WOCN (2003)	Assessment/Diagnosis 1. Risk assessment 2. Pressure ulcer assessment 3. Assessment for potential complications 4. Assessment of factors that impede healing Treatment 1. Care plan 2. Wound cleansing, debridement, and dressing 3. Management of infection (culture, topical antibiotics, systemic antibiotics) 4. Tissue load management, including positioning and use of pressure-reducing devices 5. Pain management 6. Nutritional assessment and intervention 7. Referral for surgical intervention (direct closure, skin grafts, flaps) 8. Adjuvant therapy (growth factors, electrical stimulation, noncontact normothermic radiant heat, vacuum-assisted wound closure) Note: Ultrasound, electromagnetic therapy, and hyperbaric oxygen therapy were discussed but not recommended. 9. Monitoring of healing pressure ulcers NGC Note: Portions of this guideline address prevention of pressure ulcers, a topic addressed in a separate synthesis (see NGC synthesis Prevention of Pressure Ulcers).

TABLE 2: COMPARISON OF RECOMMENDATIONS FOR MANAGEMENT OF PRESSURE ULCERS
Assessment

CSCM (2000 reviewed 2005)	<u>Assessment Following Onset of a Pressure Ulcer</u> Assessment of the Individual With a Pressure Ulcer Perform an initial comprehensive assessment of the individual with a pressure ulcer, to include: • Complete history • Physical examination and laboratory tests • Psychological health, behavior, cognitive status, and social and financial resources • Availability and utilization of personal care assistance • Positioning, posture, and related equipment (Scientific evidence: I, II, III, V; Grade of recommendation: A, B, C; Strength of panel opinion: Strong) Assessment of the Pressure Ulcer Describe in detail an existing pressure ulcer. Include the following parameters: • Anatomical location and general appearance • Size (length width, depth, and wound area) • Stage • Exudate/odor • Necrosis • Undermining • Sinus tracts • Infection • Healing (granulation and epithelialization) • Wound margins/surrounding tissue (Scientific evidence: I, II, V; Grade of recommendation: A, B, C; Strength of panel opinion: Strong)

UIGN (2002)	Description of Intervention
	
	• Assessment of pressure ulcers should focus upon the following factors:
	  • Location and stage of ulcer (Stage 1 to 4)
	  • Size of ulcers (i.e., length, width and depth)
	  • Presence of tracts or undermining
	  • Ulcer bed appearance
	  • Granulation tissue
	  • Yellow slough
	  • Eschar
	  • Drainage
	  • Presence of rolled wound edges
	  • Odor

	• Peri-wound skin condition • Color photos taken on initial assessment and reevaluation are very helpful in monitoring changes in the wound tissue. However, care must be taken to ensure that the photo accurately depicts the appearance of the wound. • Reassess pressure ulcers weekly. If the condition of the patient or the wound deteriorates, reevaluate as soon as noted. Refer to Appendix B in the original guideline document for a Pressure Ulcers Assessment Guide to track the healing progress of the ulcer.

WOCN (2003)	Assessment
	
	• Perform risk assessment on entry to a healthcare setting and repeat on a regularly scheduled basis or when there is a significant change in the individual's condition. Level of evidence = C.
	  • Acute care: Perform initial assessment at admission and reassess at least every 48 hours or whenever the patient's condition changes or deteriorates.
	  • Long-term care: Perform initial assessment at admission. Reassess weekly for the first 4 weeks, then quarterly after that, and whenever the resident's condition changes or deteriorates.
	  • Home-health care: Perform initial assessment at admission and reassess every visit.
	• Identify high-risk settings and groups to target prevention efforts to minimize risk. Level of evidence = C.
	• Inspect skin and bony prominences at least daily. Any skin changes should be documented including a description of the skin changes as well as any action taken. Level of evidence = C.
	• Assess for cognition, sensation, immobility, friction, shear, and incontinence. Level of evidence = C.
	• Perform nutritional assessment on entry into a new healthcare setting and whenever there is a change in the individual's condition that may increase the risk of malnutrition. Level of evidence = C.
	• Assess laboratory parameters to determine nutritional status, which may include albumin or pre-albumin, transferring, and total lymphocyte count. Level of evidence = C.
	• Assess nutrition to measure effectiveness of nutritional interventions. Level of evidence = C.
	• Assess for history of prior ulcer and presence of current ulcer, previous treatments, or surgical interventions that increase risk for additional pressure ulcers. Level of evidence = C.
	• Assess and monitor pressure ulcer(s) at each dressing change, and reassess and measure at least weekly, including location, tissue type, size, tunneling, exudates, presence/absence of infection, wound edges, stage, periwound skin, pain, and

	adherence to prevention and treatment. Level of evidence = C. • Assess for factors that impede healing status, such as comorbid conditions or medications. Level of evidence = C. • Partial thickness ulcers (stage II) should show evidence of healing within 1 to 2 weeks. Reduction in wound size following 2 weeks of therapy for Stage III and IV pressure ulcers has also been found to predict healing. If the condition of the patients or the wound deteriorates, reevaluate the treatment plan as soon as evidence of deterioration is noted. Level of evidence = B. • Assess for potential complications such as fistula, abscess, osteomyelitis, bacteremia, cellulites, and cancer. Level of evidence = C.
TREATMENT	
Care Plans	
CSCM (2000 reviewed 2005)	A comprehensive treatment plan includes assessment of risk, health status of the individual, and status of the pressure ulcer. The elements of a treatment plan include cleansing, debridement, dressings, surgery, nutrition and management of tissue loads. These elements represent standard treatment procedures as reflected in current literature and practice. However, new research and innovative approaches are being developed in the areas of adaptive therapies.

UIGN (2002)	Description of Intervention
	• Treatment of pressure ulcers should center on the following intervention activities:
	  • Management of tissue loads (i.e., pressure, friction, and shearing)
	  • Nutritional assessment and support
	  • Ulcer care
	  • Management of bacterial colonization and infection

WOCN (2003)	• Implement appropriate strategies/plans to:
	  a. Attain/maintain intact skin.
	  b. Prevent complications.
	  c. Promptly identify or manage complications.
	  d. Involve patient and caregiver in self-management
	• Implement cost-effective strategies/plans that prevent and treat pressure ulcers

Wound Care	

CSCM (2000 reviewed 2005)	Cleansing Cleanse pressure ulcers at each dressing change. • Use minimum mechanical force when cleaning with gauze, cloth, or sponge. • Use enough irrigation pressure to enhance cleansing without causing trauma to the wound. • Use normal saline or wound cleansers. • Avoid antiseptic agents. • Consider hydrotherapy for ulcers containing large amounts of exudate and necrotic tissue. (Scientific evidence: I, III, V; Grade of recommendation: A, C; Strength of panel opinion: Strong) Debridement Debride devitalized tissue from pressure ulcers using a method appropriate to the ulcer's status and the individual's condition and goals. • Debride areas in which there is eschar and devitalized tissue (Scientific evidence: V; Grade of recommendation: C; Strength of panel opinion: Strong) Refer to Table 7 in the original guideline document for a comparison of debridement methods. Dressings Use dressings that will keep the ulcer bed continuously moist and the surrounding intact skin dry. • Use a dressing that controls exudate, but does not desiccate the ulcer bed or macerate surrounding tissue. • Loosely fill pressure ulcer cavities with dressing material to avoid dead space; avoid overpacking the ulcer • Monitor the placement of all dressings, especially those in anatomical areas in which they are difficult to keep intact • Perform dressing changes on a specific schedule based on assessment of the individual, the ulcer, and the condition of the dressing. Consult the dressing manufacturer's package insert for general information and about the frequency of dressing changes. (Scientific evidence: I, II; Grade of recommendation: A, B; Strength of panel opinion: Strong)

	Refer to Table 8 in the original guideline document for a comparison of major dressing categories.
UIGN (2002)	Description of Intervention • Remove necrotic tissue with sharp, mechanical, autolytic, or enzymatic debridement. Autolytic and enzymatic debridement methods generally are specific to necrotic tissue and do not harm healthy tissue. However, they may be slow to debride the necrotic tissue. Sharp debridement is the most expedient at removing devitalized tissue, but does require specially trained personnel to perform (Bale & Harding, 1990; Barrett & Klibanski, 1973; Bryant, 2000; Longe, 1986; Michocki & Lamy, 1976) (Evidence Grade = C). • Cleanse with normal saline or commercially prepared wound cleanser at each dressing change. For the majority of wounds, isotonic saline is adequate to cleanse the wound surface. In those instances when the wound surface is more heavily laden with surface debris, a commercial wound cleanser may be used. Healing cannot occur until all inflammatory foreign material is removed (Bryant, 2000; Bryant et al., 1984; Foresman et al., 1993; AHCPR, 1994) (Evidence Grade = C). • Use enough irrigation pressure to cleanse wound without causing trauma. Safe and effective ulcer irrigation pressures range from 4 to 15 pounds per square inch (psi). (Refer to Appendix C in the original guideline document for details on delineation of irrigation pressures for various devices) (Brown et al., 1978; Green et al., 1971; Gross, Cutright, & Bhaskar, 1972; Hamer et al., 1975; Stevenson et al., 1976; Longmire, Broom, & Burch, 1987; Rodeheaver et al., 1975; Bhaskar, Cutright, & Gross, 1969; Wheeler et al., 1976) (Evidence Grade = B). • Avoid use of antiseptics (e.g., povidone iodine, iodophor, Dakin's solution, hydrogen peroxide, acetic acid) (Custer et al., 1971; Johnson, White, & McAnalley, 1989; Rodeheaver et al., 1980; Rydberg & Zederfeldt, 1968) (Evidence Grade = B). • Apply dressings that maintain a moist wound environment. Examples of moist dressings include, but are not limited to, hydrogels, hydrocolloids, saline moistened gauze, transparent film dressings. The ulcer bed should be kept continuously moist (Kurzuk-Howard, Simpson, & Palmieri, 1985; Fowler & Goupil, 1984; Gorse & Messner, 1987; Sebern, 1986; Alm et al., 1989; Colwell, Foreman, & Trotter, 1993; Neill et al., 1989; Oleske et al., 1986; Xakellis & Chrischilles, 1992) (Evidence Grade = B). • Keep the surrounding (periwound) intact skin dry while keeping the ulcer bed moist.
WOCN (2003)	Interventions: Treatment

	• Cleanse the wound at each dressing change with a noncytotoxic cleanser, minimizing trauma to the wound. Level of evidence = C. • Consider the use of high-pressure irrigation to remove slough or necrotic tissue. • Debride the ulcer of devitalized tissue. Level of evidence = C. • Do not debride dry, black eschar on heels that are nontender, nonfluctuant, nonerythematous and nonsuppurative. Level of evidence = C. • Perform wound care using topical dressings determined by wound, patient needs, cost, caregiver time, and availability. Level of evidence = C. • Choose dressings that provide a moist wound environment, keep the periwound skin dry, control exudates, and eliminate dead space. Level of evidence = C. • Reassess the wound with each dressing change to determine whether modifications are needed as the wound heals or deteriorates. Level of evidence = C.
Infection Management	

CSCM (2000 reviewed 2005)	<u>Treatment</u>
	
	Nonsurgical
	
	Topical antibiotics may be used if routine measures do not result in wound healing after several weeks. Broad spectrum agents, such as 1 percent silver sulfadiazine cream, may be used, although cross-sensitivity to other sulfonamides may occur. Mupirocin calcium cream 2 percent may be applied for pressure ulcers infected with Staphylococcus aureus and Streptococcus pyogenes. Prolonged use may result in overgrowth of nonsusceptible microorganisms, including fungi.
	
	Preoperative Care
	
	• Assess, treat, and optimize the following factors preoperatively:
	  • Local wound infection
	  • Osteomyelitis
	
	(Scientific evidence: II, III, V; Grade of recommendation: C; Strength of panel opinion: Strong)
	
	<u>Complications of Pressure Ulcers</u>
	
	Nonsurgical
	
	• Identify the presence of tissue and/or bone infection.
	  • Obtain quantitative tissue and/or bone cultures in ulcers

	not responding to routine therapeutic measures. • Obtain a tissue and/or bone biopsy to confirm infection, if necessary. (Scientific evidence: III, V; Grade of recommendation: C; Strength of panel opinion: Strong) • Management of cellulitis, osteomyelitis, and sepsis requires antibiotics. Surgical • Identify potential complications of surgical intervention, including: • Wound dehiscence/wound separation • Delayed infection and abscess • Hematoma and seroma (Scientific evidence: None; Grade of recommendation: Expert consensus; Strength of panel opinion: Strong)
UIGN (2002)	Description of Intervention • If the ulcer does not progress toward healing, the patient should be evaluated to determine if osteomyelitis is present. If diagnosed, the infection must be treated if the ulcer is to heal. • DO NOT USE SWAB CULTURES TO DIAGNOSE WOUND INFECTION because all pressure ulcers are colonized with bacteria (Bryant, 2000; Garner et al., 1988; Krizek & Robson, 1975; Rousseau, 1989; AHCPR, 1994) (Evidence Grade = C). • Consider a 2 week course of topical antibiotics for clean pressure ulcers that do not heal or continue to produce purulent exudate after 2 to 4 weeks of care as outlined in this protocol. The antibiotic should be effective against gram-negative, gram-positive, and anaerobic organisms (e.g., Iodosorb [Healthpoint], silver sulfadiazine, triple antibiotic, or silver impregnated dressings) (Bendy et al., 1964; Kucan et al., 1981) (Evidence Grade = B).
WOCN (2003)	Interventions: Treatment • Manage wound infections and differentiate between contamination, colonization, and infection. Level of evidence = C. • Obtain a quantitative culture or tissue biopsy if high levels of bacteria ($>10^5$) are suspected in a wound exhibiting clinical signs of infection such as absence of healing. • Use topical antibiotics in wounds cautiously and selectively. Level of evidence = C.

	• Consider use of topical antimicrobials if a high level of bacteria is present (>10^5). Level of evidence = C. • Use systemic antibiotics in the presence of bacteremia, sepsis, advancing cellulitis, or osteomyelitis. Level of evidence = C.
Management of Tissue Load	

CSCM (2000 reviewed 2005)	Support Surfaces and Positioning for Managing Tissue Loads
	
	<u>Bed Positioning</u>
	
	Use bed-positioning devices and techniques to prevent and treat pressure ulcers. Use devices and techniques that are compatible with the bed type and the individual's health status.
	
	• Avoid positioning individuals directly on a pressure ulcer.
	• Avoid positioning individuals directly on the trochanter
	• Use cushions and positioning aids to relieve pressure on pressure ulcers or vulnerable skin areas by elevating them away from the support surface.
	• Avoid close cutouts or donut-type cushions
	• Prevent contact between bony prominences.
	• Limit the amount of time the head of the bed is elevated
	• Develop, display, and use an individualized positioning regimen and repositioning schedule.
	
	(Scientific evidence: II, V; Grade of recommendation: B, C; Strength of panel opinion: Strong)
	
	<u>Bed Support Surfaces</u>
	
	Use pressure-reducing bed support surfaces for individuals who are at risk for or who have pressure ulcers.
	
	• Select a static support surface for individuals who can be positioned without weight bearing on an ulcer and without bottoming out on the support surface.
	• Select a dynamic support surface if the individual cannot be positioned without pressure on an ulcer, when a static support surface bottoms out, if there is no evidence of ulcer healing, or if new ulcers develop.
	• Use low-air loss and air-fluidized beds in the treatment of pressure ulcers if one or more of the following conditions exist:
	  • Pressure ulcers on multiple turning surfaces
	  • Compromised skin temperature and moisture control in the presence of large stage III or IV pressure ulcers
	
	(Scientific evidence: I, II, V; Grade of recommendation: A, B, C;

	Strength of panel opinion: Strong) <u>Wheelchair Positioning</u> Prescribe wheelchairs and seating systems according to individualized anthropometric, ergonomic, and functional principles. • Obtain specific body measurements for optimal selection of seating system dimensions. • Measure the effects of posture and deformity on interface pressure distribution. • Prescribe a power weight-shifting wheelchair system for individuals who are unable to independently perform an effective weight shift. • Use clinical judgment as well as objective data in determining the compatibility of the individual's shape with the seating system. (Scientific evidence: II, III, V; Grade of recommendation: B, C; Strength of panel opinion: Strong) Evaluate the individual's postural alignment, weight distribution, balance, stability, and pressure reduction capabilities to establish a proper sitting schedule. • Avoid positioning the wheelchair-seated individual directly on a pressure ulcer. • Allow limited sitting in individuals capable of performing weight shifts every 15 minutes. • Reposition the wheelchair-seated individual at least every hour; if this is not possible and the individual is unable to perform weight shifts, return the individual to bed. (Scientific evidence: II, III; Grade of recommendation: B, C; Strength of panel opinion: Strong) <u>Wheelchair Support Surfaces</u> Use appropriate wheelchair cushions with all individuals with spinal cord injury. • Inspect and maintain all wheelchair cushions at regularly scheduled intervals. (Scientific evidence: II, V; Grade of recommendation: B, C; Strength of panel opinion: Strong)
UIGN (2002)	Treatment of pressure ulcers should center on the following

	intervention activities: • Management of tissue loads (i.e., pressure, friction, and shearing). For further information regarding this type of management, please see the NGC summary of the UIGN guideline Prevention of Pressure Ulcers, and the NGC synthesis Pressure Ulcer Prevention.
WOCN (2003)	Interventions: Treatment • Reduce friction and shear. Level of evidence = C. • Turn patient every 2 hours. Level of evidence = C. • Utilize positioning devices to avoid placing patient on an ulcer. Level of evidence = C. • Maintain the head of the bed at 30 degrees elevation for supine positions and 30 degrees or less for side-lying. Level of evidence = C. • Use pressure relief such as low air loss or air-fluidized mattresses/beds for individuals with Stage III or IV ulcers or those with multiple ulcers over several turning surfaces. Level of evidence = A. • Shift weight for chair-bound individuals every 15 minutes; if patient cannot perform shifts, caregivers should reposition every hour. Level of evidence = C. • Limit time in chair and use pressure-relief chair cushions in the presence of pressure ulcers on sitting surfaces. Level of evidence = C. • Manage fecal and urinary incontinence. Level of evidence = C. • Select underpads, diapers, or briefs that are absorbent to wick effluent away from the skin. Level of evidence = C.
Pain Management	
CSCM (2000 reviewed 2005)	No recommendations offered.
UIGN (2002)	No recommendations provided.
WOCN (2003)	Implement measures to eliminate or control pain. Level of evidence = C. • Turn and reposition patient off ulcer(s). • Use appropriate support surfaces • Use appropriate analgesics to treat procedure-related as well as chronic pain (e.g., premedicate as needed prior to dressing

	change, debridement) • Refer to pain clinic for chronic pressure ulcer pain
Nutrition and Hydration	

CSCM (2000 reviewed 2005)	Nutrition
	
	• Assess nutritional status of all spinal-cord injury individuals on admission and as needed, based on medical status, including:
	  • Dietary intake
	  • Anthropometric measurements
	  • Biochemical parameters (prealbumin, total protein, albumin, hemoglobin, hematocrit, transferrin, and total lymphocyte count)
	
	(Scientific evidence: II, III, V; Grade of recommendation: B, C; Strength of panel opinion: Strong)
	
	• Provide adequate nutritional intake to meet individual needs, especially for:
	  • Calories (or energy)
	  • Protein
	  • Micronutrients (zinc, vitamin C, vitamin A, and vitamin E)
	  • Fluids
	
	(Scientific evidence: II, III, V; Grade of recommendation: B, C; Strength of panel opinion: Strong)
	
	• Implement aggressive nutritional support measures if dietary intake is inadequate or if an individual is nutritionally compromised.
	
	(Scientific evidence: II; Grade of recommendation: B; Strength of panel opinion: Strong)

UIGN (2002)	Description of Intervention Ensure adequate dietary intake to enhance healing. Request a consult from a dietitian and develop a nutrition plan. The stage of the wound is correlated with the severity of nutritional deficits, especially low protein intake or a below-normal serum albumin (Allman et al., 1986; Bergstrom & Braden, 1992; Berlowitz & Wilking, 1989; Breslow, Hallfrish, & Goldberg, 1991; Ek, Unosson, & Bjurulf, 1989; Hanan & Scheele, 1991; Holmes et al., 1987; Pinchcofsky-Devin & Kaminski, 1986) (Evidence Grade = B). Also check to make sure that teeth are in good condition or dentures fit properly (Evidence Grade = B).

WOCN (2003)	Interventions: Treatment Ensure adequate nutrient and fluid intake to maximize the potential for wound healing: 35 to 40 kcalories per kg of body weight/day for total calories and 1.0 to 1.5 g protein/kg of body weight/day for total protein. Level of evidence = C.
Surgical Intervention	
CSCM (2000 reviewed 2005)	Reassessment <u>Surgical</u> Refer appropriate individuals with complex, deep stage III pressure ulcers (i.e., undermining, tracts) or stage IV pressure ulcers for surgical evaluation. When surgery is indicated, include the following tenets of surgical treatment: • Excising of ulcer, surrounding scar, bursa, soft tissue calcification, and underlying necrotic or infected bone • Filling dead space, enhancing vascularity of the healing wound, and distributing pressure off the bone • Resurfacing with a large regional pedicle flap, with suture line away from the area of the direct pressure, and one that does not encroach on adjacent flap territories • Preserving options for future potential breakdowns (Scientific evidence: V; Grade of recommendation: C; Strength of panel opinion: Strong) Preoperative Care Assess, treat and optimize the following factors preoperatively: • Local wound infection • Nutritional status • Bowel regulation • Severe spasm and contractures • Comorbid conditions • Previous ulcer surgery • Smoking • Osteomyelitis • Urinary tract infection • Heterotopic ossification (Scientific evidence: II, III, V; Grade of recommendation: B, C; Strength of panel opinion: Strong)

	Postoperative Care Be cognizant of postoperative care procedures. • Position the individual in a manner that keeps pressure off a fresh surgical site. • Use an air-fluidized bed when pressure on the surgical flap is unavoidable. • Progressively mobilize the individual to a sitting position over at least 4 to 8 weeks to prevent reinjury of the ulcer or surgical site. • Provide subsequent patient education on pressure management and skin inspection. (Scientific evidence: V; Grade of recommendation: C; Strength of panel opinion: Strong) Complications of Pressure Ulcers <u>Surgical</u> Identify potential complications of surgical intervention, including: • Wound dehiscence/wound separation • Delayed infection and abscess • Hematoma and seroma (Scientific evidence: None; Grade of recommendation: Expert consensus; Strength of panel opinion: Strong)
UIGN (2002)	No recommendations offered.

WOCN (2003)	Interventions: Treatment
	
	Evaluate the need for operative repair for patients with Stage III and IV ulcers who do not respond to conservative therapy. Level of evidence = C.
	
	• Prior to surgery, the patient should be in an optimal state, and factors associated with impaired healing should be controlled
	• Operative procedures include direct closure, skin grafts, and flaps.
	  • A two-stage procedure with separation of wound debridement from the reconstruction is preferable
	  • Types of flaps used to cover pressure ulcers include fasciocutaneous and myocutaneous flap. The fasciocutaneous flap reportedly provides a better long-term result in surgical reconstruction of pressure ulcers than the myocutaneous flap.

	• Postoperatively, the operated region must be relieved of pressure with gradual increase in tissue load, and the patient rehabilitated and educated in self-investigation, pressure relief, nutrition and prophylaxis. There is limited evidence supporting the use of either flotation mattresses or air-fluidized beds for post-operative patients. • Surgical reconstructive options for individuals with recurrent Stage III or IV ulcers or multiple pressure ulcers may be limited because of previous surgeries, a shortage of available tissue, and impaired vascularity of the area (Niazi, Salzberg, Bryne, & Viehbeck, 1997). Some patients may not be surgical candidates because of malnutrition, immobility, lack of compliance with treatment regimens, and other chronic diseases • Rates of surgical complications and recurrence are high. • The risk/benefit of surgery must be discussed with the patient/caregivers.
Adjuvant Therapy	
CSCM (2000 reviewed 2005)	Treatment <u>Nonsurgical</u> Electrical Stimulation Use electrical stimulation to promote closure of stage III or IV pressure ulcers combined with standard wound care interventions. (Scientific evidence: I, II; Grade of recommendation: A; Strength of panel opinion: Strong) <u>Adjunctive Therapies</u> Literature reviews were done for several adjunctive wound therapies, including those that used physical forms of energy, such as ultraviolet radiation, low-energy laser radiation, normothermia, ultrasound, subatmospheric pressure therapy, hyperbaric oxygen, topical agents, cytokine growth factors, and nonantibiotic systemic drugs. These reviews did not provide sufficient supporting evidence to justify recommending them for the treatment of pressure ulcers in individuals with spinal cord injury.
UIGN (2002)	Adjuvant wound therapies such as hyperbaric oxygenation, negative pressure wound therapy, and electrical stimulation may be considered on an individual basis for those wounds that do not respond to more traditional therapies and osteomyelitis has been ruled out (Bryant, 2000) (Evidence Grade = C).

WOCN (2003)	Interventions: Treatment Consider adjunctive therapies to enhance the healing of recalcitrant Stage III and IV wounds such as: • Growth Factors--platelet-derived growth factor-BB (rPDGF-BB). Level of evidence = A. • Electrical stimulation. Level of evidence = A. • Noncontact normothermic radiant heat therapy. Level of evidence = A. • Topical negative pressure (i.e., vacuum-assisted wound closure). Level of evidence = A.
Reassessment and Ongoing Care	

CSCM (2000 reviewed 2005)	Reassessment
	
	Monitor and assess the pressure ulcer on a consistent, ongoing basis to determine the adequacy of the plan of care.
	
	• Monitor the pressure ulcer at each dressing change.
	• Document ulcer assessment at least weekly and every time the condition of the pressure ulcer or the individual changes.
	
	(Scientific evidence: None; Grade of recommendation: Expert consensus; Strength of panel opinion: Strong)
	
	Modify the treatment plan if the ulcer shows no evidence of healing within 2 to 4 weeks.
	
	• Review individual risk factors when assessing the healing of pressure ulcers.
	• Evaluate healing progress using an instrument or other quantitative measurements.
	
	(Scientific evidence: I, V; Grade of recommendation: A, C; Strength of panel opinion: Strong)
	
	Complications of Pressure Ulcers
	
	<u>Nonsurgical</u>
	
	• Identify the potential complications of immobility associated with pressure ulcer management and implement preventive and therapeutic measures for:
	  • Nutritional deficiencies and dehydration
	  • Decreased range of motion
	  • Deconditioning (cardiopulmonary, cardiovascular, and

	musculoskeletal)
	
	(Scientific evidence: III, V; Grade of recommendation: C; Strength of panel opinion: Strong)
	
	• Manage hypergranulation tissue that may impede ulcer healing.
	
	(Scientific evidence: V; Grade of recommendation: C; Strength of panel opinion: Strong)
	
	• Identify the potential psychosocial impacts of pressure ulcers and immobility and provide referral for therapeutic interventions based upon the individual's characteristics and circumstances. Refer to appropriate resources for problem resolution, including:
	  • Vocational rehabilitation services
	  • Peer counseling and support groups
	  • Formal psychotherapy and/or family therapy
	
	(Scientific evidence: III, V; Grade of recommendation: C; Strength of panel opinion: Strong)
	
	<u>Surgical</u>
	
	• Identify potential complications of surgical intervention, including:
	  • Wound dehiscence/wound separation
	  • Delayed infection and abscess
	  • Hematoma and seroma
	
	(Scientific evidence: None; Grade of recommendation: Expert consensus; Strength of panel opinion: Strong)

UIGN (2002)	• After initial treatment of pressure ulcers begins, the size of the ulcer may increase, especially when the ulcer initially contains necrotic tissue. However, the ulcer should become clearer and cleaner despite the increase in size. The treatment simply exposes more of the ulcer, thereby leading to the increased size. If the ulcer increases in size and does not become cleaner and clearer, then the treatment needs to be altered, as the ulcer is not healing appropriately. • Protect from further injury to the ulcer or additional ulcer formation by utilizing interventions outlined for patients at risk. • For further information regarding this type of management, please see the NGC summary of the UIGN guideline Prevention of Pressure Ulcers. Also see the NGC guideline synthesis Pressure Ulcer Prevention. • Reassess pressure ulcers weekly. If the condition of the patient or the wound deteriorates, reevaluate as soon as noted. Use the Pressure Ulcers Assessment Guide (see Appendix B in

	the original guideline document) to track the healing progress of the ulcer.
WOCN (2003)	Interventions: Treatment Monitor vigilantly for recurrence of any pressure ulcers, and emphasize to patients and families that measures to prevent and manage pressure ulcers are lifelong endeavors. Level of evidence = C.

TABLE 3: BENEFITS AND HARMS	
Benefits	
CSCM (2000 reviewed 2005)	The benefits of clinical practice guidelines for the spinal cord medicine practice community are numerous. Among the more significant applications and results are the following: • Clinical practice options and care standards • Medical and health professional education and training • Building blocks for pathways and algorithms • Evaluation studies of clinical practice guidelines use and outcomes • Research gap identification • Cost and policy studies for improved quantification • Primary source for consumer information and public education • Knowledge base for improved professional consensus building Additional benefits include: • Reduced incidence and recurrence of pressure ulcer in patients with spinal cord injury
UIGN (2002)	• Improved size and condition of pressure ulcer • Prevention of ulcer progression • Improved consistency of care along with decreased variability of practice

WOCN (2003)	• Early identification of individuals at risk for developing pressure ulcers and early prevention measures.
	• Appropriate strategies/plans to:
	  • Attain/maintain intact skin
	  • Prevent complications

	• Promptly identify or manage complications • Involve patient and caregiver in self-management • Cost-effective strategies/plans that prevent and treat pressure ulcers
Harms	
CSCM (2000 reviewed 2005)	Mechanical debridement is slow and can be painful and should be discontinued when necrotic tissue has been removed. Bleeding, the need for anesthesia and its associated risks, and possible injury to nervous or other viable tissue are the main disadvantages of sharp or surgical debridement techniques.
UIGN (2002)	Isolated instances of patients being injured when placed on "high tech" low air loss beds
WOCN (2003)	• Wounds treated with topical antibiotics may develop resistant organisms over time. • Topical creams, ointments, and gels containing antibiotics may cause sensitivity reactions. • Rates of surgical complications and recurrence are high. • Complications rates have been reported at 7% to 49%. • Osteomyelitis has been cited as the major cause of breakdown after surgery and biopsy is recommended to rule out osteomyelitis in Stage IV pressure ulcer patients.

TABLE 4: EVIDENCE RATING SCHEMES AND REFERENCES	
CSCM (2000 reviewed 2005)	Hierarchy of the Levels of Scientific Evidence: I. Large randomized trials with clear-cut results (and low risk of error) II. Small randomized trials with uncertain results (and moderate to high risk of error III. Nonrandomized trials with concurrent or contemporaneous controls IV. Nonrandomized trials with historical controls V. Case series with no controls Categories of the Strength of Evidence Associated With the Recommendations A. The guideline recommendation is supported by one or more

	level I studies B. The guideline recommendation is supported by one or more level II studies C. The guideline recommendation is supported only by level III, IV, or V studies Levels of Panel Agreement with the Recommendation Based on a 5-point scale (1 corresponding to neutrality; 5 representing maximum agreement) Low: Mean agreement score of 1.00 to 2.32 Moderate: Mean agreement score of 2.33 to 3.66 Strong: Mean agreement score of 3.67 to 5.00 Note: If the literature supporting a guideline recommendation came from two or more levels, the number and the level of evidence supporting the studies are reported (e.g., a guideline recommendation that is supported by two studies, one a level III and the other a level V, the scientific evidence would be indicated as III, V). Likewise, if a guideline recommendation is supported by literature that crossed two categories, both categories are reported (e.g., a recommendation that includes both level II and III studies would be classified as category B, C).
UIGN (2002)	Evidence Grades A. Evidence from well-designed meta-analysis. B. Evidence from well-designed controlled trials, both randomized and nonrandomized, with results that consistently support a specific action (e.g., assessment, intervention or treatment). C. Evidence from observational studies (e.g., correlational, descriptive studies) or controlled trials with inconsistent results. D. Evidence from expert opinion or multiple case reports References Supporting the Recommendations Bryant R. Acute and chronic wounds. St. Louis (MO): Mosby; 2000. Nursing management. p. 431-54. Agency for Health Care Policy and Research (AHCPR). Treatment of pressure ulcers. Rockville (MD): U.S. Department of Health and Human Services, Public Health Service, AHCPR; 1994 Dec. 154 p. (Clinical practice guideline; no. 15). [333 references] Allman RM, Laprade CA, Noel LB, Walker JM, Moorer CA, Dear MR, Smith CR. Pressure sores among hospitalized patients. Ann Intern Med 1986 Sep;105(3):337-42. PubMed Alm A, Hornmark AM, Fall PA, Linder L, Bergstrand B, Ehrnebo M,

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WOCN (2003)	Rating Scheme for the Strength of the Evidence Each article was assigned a level of evidence rating scheme using the following criteria: Level I: A randomized controlled trial (RCT) that demonstrates statistically significant difference in at least one important outcome defined by p<.05. Level II: A RCT that does not meet Level I criteria. Level III: A nonrandomized trial with contemporaneous controls selected by some systematic method. A control may have been selected because of its perceived suitability as a treatment option for individual patients. Level IV: A before-and-after study or a case series of at least 10 patients using historical controls or controls drawn from other studies. Level V: A case series of at least 10 patients with no controls. Level VI: A case report of fewer than 10 patients. Level of Evidence Rating Level A: Two or more RCTs on pressure ulcers in humans (at Levels I or II), meta-analysis of RCTs, or Cochrane Systematic Review of RCTs Level B: One or more controlled trials on pressure ulcers in humans or two or more supporting trials in an animal model (at Level III) Level C: One supporting controlled trial, at least two supporting case series that were descriptive studies on humans, or expert opinion. Where a level of evidence rating is not included, the information presented represents a consensus of the panel members.

GUIDELINE CONTENT COMPARISON

The Consortium for Spinal Cord Medicine (CSCM), University of Iowa Gerontological Nursing Interventions Research Center (UIGN), and Wound, Ostomy, and Continence Nurses Society (WOCN) present recommendations for treatment of pressure ulcers. All three guidelines provide explicit reasoning behind their judgments, ranking the level of evidence for each major recommendation.

Some guidelines are broader in scope than others. For example, CSCM and WOCN address prevention of pressure ulcers in addition to treatment; UIGN addresses organizational and policy issues related to pressure ulcer management, and CSCM addresses areas where more research is needed.

The content of the CSCM guideline is tailored to individuals with spinal cord injury. It considers some issues not addressed by the other guidelines (which focus on the general population of adults with pressure ulcers), including the need for individualized wheelchair prescribing and additional aspects of positioning relevant to wheelchair-bound patients.

Areas of Agreement

Assessment/Diagnosis

The guidelines are in general agreement that the pressure ulcer should be assessed within the context of the patient's physical and psychosocial health, including functional, nutritional, and cognitive status and comorbidities. They also agree that initial assessment of a pressure ulcer should include careful evaluation and documentation of the wound characteristics, including its location, size, and depth; existence of tunneling, undermining, and sinus tracts; color of the wound and surrounding tissue; drainage; and odor.

As a recommended initial assessment tool for characterizing ulcer stage, the National Pressure Ulcer Advisory Panel (NPUAP) four-stage system is included in or referred to by the UIGN and WOCN guidelines. CSCM notes that, while the NPUAP system is one of several systems developed to describe the depth of pressure ulcers and is the most commonly used, other systems use more descriptive criteria and possess good interrater reliability.

Treatment

Wound Care

The guidelines agree that pressure ulcers should be carefully cleansed, debrided, and dressed. Non-cytotoxic cleansers, specifically normal saline solution, should be used rather than antiseptic solutions. CSCM, UIGN, and WOCN indicate that irrigation pressure should be strong enough to enhance cleansing without causing trauma to the wound bed. According to UIGN, pressure of 4 to 15 pounds per square inch (psi) is safe and effective, and specifies devices that will achieve these pressures.

The guidelines are also in agreement that the method of debridement (autolytic, enzymatic, mechanical, or sharp debridement) should be selected based on the patient's condition, treatment goals, and the amount of eschar and necrotic tissue in the wound. WOCN recommends against debridement of dry, black eschar on heels that are nontender, nonfluctuant, nonerythematous and nonsuppurative.

The guidelines also agree that wound dressings should keep the ulcer bed continuously moist and the surrounding tissue dry. The type of dressing should be chosen based on wound characteristics.

Infection Management

WOCN emphasizes the need to distinguish between infection, contamination, and colonization of the wound. All three guidelines agree that clean wounds not responding to treatment within 2 to 4 weeks can be treated with a two-week trial of topical antibiotics. WOCN recommends that topical antibiotics be used cautiously and selectively and be considered when high levels of bacteria are present. The WOCN guideline also notes that wounds treated with topical antibiotics may develop resistant organisms over time. When infection is suspected, an appropriate deep tissue culture or biopsy should be obtained (CSCM, WOCN). Of the two guidelines that address systemic infection, both agree that systemic antibiotics are appropriate when there is evidence of cellulitis, osteomyelitis, or sepsis (CSCM, WOCN).

Tissue Load Management

All of the guidelines address tissue load management, including the need to protect tissue by minimizing pressure and shear. CSCM and WOCN address positioning, use of pressure-reducing devices, and lifting and positioning aids both to aid healing of pressure ulcers and prevent development of new ulcers. The CSCM guideline, targeting care for persons with spinal cord injury, provides the most extensive recommendations concerning wheelchair positioning, including the need to prescribe wheelchairs according to individualized anthropometric, ergonomic, and functional principles and to regularly inspect wheelchair cushions. UIGN addresses tissue load management in a separate guideline on prevention (See NGC guideline synthesis on Pressure Ulcer Prevention).

Pain Management

One guideline (UIGN) addresses the need for adequate overall pain management. WOCN specifically notes the need for management of pain associated with debridement.

Nutritional Support

The guidelines are in general agreement that measures should be taken to assess nutritional status and ensure adequate nutrition and hydration. UIGN suggests consultation with a dietitian; CSCM, UIGN and WOCN point out the need for optimal protein intake to promote wound healing. CSCM considers the need for nutritional supplements.

Surgical Intervention

CSCM and WOCN recommend that surgical intervention be considered for Stage III and IV ulcers that have not responded to conservative therapy. CSCM addresses surgery in the greatest detail, including recommendations for preoperative and postoperative care and potential post-surgery complications in persons with spinal cord injury. UIGN does not address surgical interventions.

Adjuvant Therapy

All of the guidelines address the use of adjuvant therapies when an ulcer has not responded to conventional therapy. All agree that electrical stimulation is an appropriate therapy to consider. There are differences, however, among the guidelines concerning the effectiveness of other adjuvant therapies; these differences are discussed below.

Reassessment and Ongoing Care

The guidelines are in general agreement that pressure ulcers should be monitored at each dressing change and reassessed at least weekly.

CSCM points out the need to identify the potential psychosocial impacts of pressure ulcers and immobility in persons with spinal cord injury and to provide referral for therapeutic interventions such as vocational rehabilitation, peer counseling, support groups, and psychotherapy.

Areas of Differences

Adjuvant Therapy

Although there is general agreement that electrical stimulation is an appropriate therapy, there is less agreement concerning other adjuvant therapies. For example, CSCM did not find sufficient evidence to recommend any adjuvant therapy except electrical stimulation, whereas WOCN states that growth factors can be helpful for chronic non-healing wounds. Additionally, UIGN and WOCN recommend vacuum-assisted closure (negative pressure therapy), with WOCN also recommending normothermic heat therapy. UIGN alone recommends hyperbaric oxygen therapy.

This Synthesis was prepared by ECRI on October 31, 2006. The information was verified by UIGN on November 21, 2006, by AMDA and WOCN on December 5, 2006, and by RNAO on December 11, 2006. This Synthesis was updated by ECRI Institute on July 16, 2007 following the removal of the AMDA, RNAO, and Singapore MOH guidelines from the NGC Web site.

Internet citation: National Guideline Clearinghouse (NGC). Guideline synthesis: Management and treatment of pressure ulcers. In: National Guideline Clearinghouse (NGC) [website]. Rockville (MD): 2006 Dec (revised 2007 Jul). [cited YYYY Mon DD]. Available: http://www.guideline.gov.

Date Modified: 7/16/2007